

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: A24C 5/18	A1	(11) International Publication Number: WO 96/27304
		(43) International Publication Date: 12 September 1996 (12.09.96)

(21) International Application Number: PCT/GB96/00533

(22) International Filing Date: 7 March 1996 (07.03.96)

(30) Priority Data:

9504677.7

8 March 1995 (08.03.95)

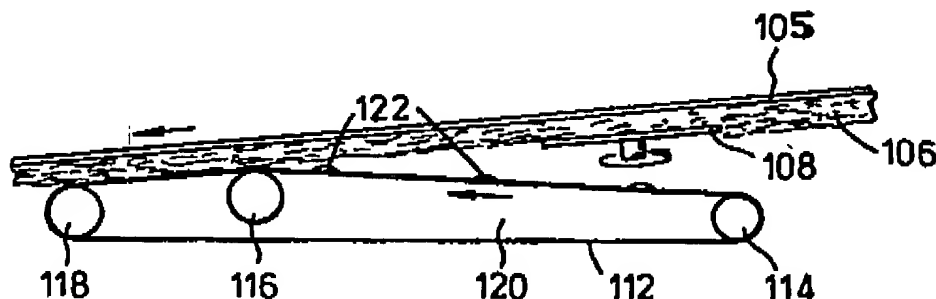
GB

(71) Applicant (for all designated States except US): MOLINS PLC
[GB/GB]; 11 Tanners Drive, Blakelands, Milton Keynes
MK14 5LU (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DAWSON, John
[GB/GB]; Haw Lane, Saunderton, High Wycombe,
Buckinghamshire HP14 4JE (GB). DYETT, Derek, Henry
[GB/GB]; Haw Lane, Saunderton, High Wycombe,
Buckinghamshire HP14 4JE (GB). SHARP, Norman,
Lindsey [GB/GB]; Haw Lane, Saunderton, High Wycombe,
Buckinghamshire HP14 4JE (GB).(74) Agent: HIRSH, Ivan, Yehudi; Molins plc, Group Patent Dept.,
Haw Lane, Saunderton, High Wycombe, Buckinghamshire
HP14 4JE (GB).(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY,
CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS,
JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD,
MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD,
SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN,
ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent
(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent
(AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU,
MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, ML, MR, NE, SN, TD, TG).**Published***With international search report.**Before the expiration of the time limit for amending the
claims and to be republished in the event of the receipt of
amendments.*

(54) Title: CIGARETTE MAKING MACHINE



(57) Abstract

A cigarette making machine includes a conveyor (96; 105) which is arranged to carry a cigarette filler stream (97; 106), with the aid of suction, past a trimming device (14) which removes excess tobacco at a set distance from the conveyor, and a second conveyor (98; 112) which moves in a substantially linear direction converging towards the first conveyor and progressively presses the filler stream at cigarette end regions which are required to have a greater density.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

W 96/27304

PCT/GB96/00533

1

Cigarette Making Machine

Cigarette making machines commonly form a cigarette filler stream by showering tobacco onto a suction band. The filler stream is then usually trimmed, and it is common for the trimming device to be arranged to leave additional quantities of tobacco on the suction band at regular intervals corresponding to the positions of the cigarette ends. These "dense ending" additions of tobacco help to ensure that the ends of the finished cigarettes cut from the continuous rod formed by enclosing the filler in a continuous wrapper web are reasonably firm and are not excessively prone to tobacco falling out during further handling of the cigarettes, including packing.

Such dense end trimming devices commonly trim the cigarette filler stream at cyclically varying levels so that the depth of the filler stream remaining after trimming is greater in the regions of the cigarette ends than it is elsewhere.

Examples of dense ending trimming devices are shown in U.S. patents Nos. 3032041 and 5143094.

The present invention is concerned with different ways of dense ending which involve trimming the tobacco stream at a set level (which may change in response to a cigarette weight control system) while arranging that more tobacco is left on the filler stream conveyor in the regions of the cigarette ends.

According to one aspect of this invention, a cigarette making machine includes a conveyor which is arranged to carry a cigarette filler stream, with the aid of suction, past a trimming device which removes excess tobacco at a set distance from the conveyor, and a second conveyor which moves in a substantially linear direction converging towards the first conveyor and progressively presses the filler stream at cigarette end regions which are required to have a greater density.

According to another aspect of this invention a cigarette filler stream is formed by showering tobacco into a trough defined by at least one band which is formed with recesses or apertures at regular positions at which the cross-sectional area of the filler stream, preferably after trimming at a set level, will be greater than elsewhere owing to the fact that the filler stream formed from the showered tobacco extends into the recesses or apertures in the band.

If, in particular, the band has apertures, there may be an additional

WO 96/27304

PCT/GB96/00533

2

1 band which lies between the first band and the tobacco and is flexible so
2 as to be able to deflect into the apertures to accommodate the dense
3 ending tobacco while basically covering the apertures so as to prevent
4 tobacco from passing through the apertures. The first or main band may
5 be driven by a pulley having radial projections which enter the apertures
6 in the band and displace the flexible band from the apertures prior to the
7 filler stream being transferred from the bands and being enclosed in a
8 wrapper web. Alternatively the additional band may lie on the side of the
9 main band remote from the tobacco so as to cover the apertures in the
10 main band on the inside.

11 The band with apertures or recesses preferably forms the "bottom"
12 of the trough into which the tobacco is showered. However, in the
13 common case of a machine in which tobacco is showered upwards to
14 form a filler stream on the underneath surface of a suction band, the
15 trough is in effect inverted so that the "bottom" of the trough in fact
16 corresponds to the upper surface of the filler stream. In such a machine,
17 the apertured or recessed band of this invention is preferably
18 air-pervious so that suction can be applied through it to hold the filler
19 stream against the band. The second, flexible band should then also be
20 air-pervious and may be of woven nylon construction for example. After
21 trimming, the filler stream may be carried solely by the second band to
22 the garniture in which the filler stream is enclosed in a wrapper web to
23 form a continuous cigarette rod; the same may apply if the first band
24 has recesses, rather than apertures, to form dense end portions.

25 Instead of forming the "bottom" of the trough, the recessed or
26 apertured band may form a side wall of the trough, in which case there is
27 preferably a similar band forming the other side wall of the trough. The
28 "bottom" of the trough in this case may be a fixed wall or a further suction
29 band.

30 Another possible arrangement according to this invention involves
31 a trough effectively on its side to receive horizontally showered tobacco.
32 The "bottom" of the trough is preferably formed by a recessed or
33 apertured band, and the filler stream formed on it is then preferably
34 received by a further band which carries the filler stream on its
35 underneath surface by means of suction and delivers the filler stream
36 into the garniture.

37 The recessed or apertured band may, for example, in each case
38 be in the form of an initially impervious belt (possibly a timing belt with

WO 96/27304

PCT/GB96/00533

3

1 teeth whereby it is driven) which is perforated by pins or other means
2 (e.g. a laser) so as to be appropriately air-pervious; in the case of a belt
3 with recesses (rather than apertures) for forming the dense ends, the
4 perforations are preferably also applied to the recessed areas. Another
5 possibility is that the band may be woven with a cyclically varying weft
6 pitch to form thicker and thinner (recessed) areas, or a woven band of
7 uniform thickness may have perforated or woven patches bonded to it at
8 regular intervals.

9 The second, flexible band (if used) may be woven in such a way
10 as to have strong edges and an elastic central region which can readily
11 deflect into the recesses or apertures in the main band.

12 Compared with dense ending by means of the trimming devices
13 mentioned above, the present invention enables dense ending to be
14 achieved without excessive use of additional tobacco. This is because
15 the denser portions of the filler stream are well defined in their location
16 and length; in contrast, denser ends produced by trimming devices
17 which form outwardly projecting mounds of tobacco tend to be less well
18 defined since the mounds tend to spread for various reasons, so that
19 adequate density at the actual cigarette ends needs to be ensured by
20 overapplying the additional tobacco.

21 The amount of tobacco removed (if any) by trimming in the
22 present invention can be substantially less than is customarily thought
23 desirable in conventional machines.

24 Examples of machines according to this invention will be
25 described with reference to the accompanying drawings. In these
26 drawings:

27 Figure 1 is a diagrammatic front view of one machine;

28 Figure 2 is an enlargement of part of Figure 1;

29 Figure 3 is a diagrammatic front view of a different machine;

30 Figure 4 is a plan view of part of another different machine;

31 Figure 5 is a diagrammatic front view of another machine;

32 Figure 6 is a diagrammatic plan view of part of another machine;

33 Figure 7 is an enlarged fragmentary cross-section on the line
34 VII-VII in Figure 6;

35 Figure 8 is a diagrammatic plan view of part of another machine;

36 Figure 9 is a section on the line IX-IX in Figure 8;

37 Figure 10 is a sectional view showing a possible detail of the
38 machine shown in Figure 8;

WO 96/27304

PCT/GB96/00533

4

1 Figure 11 is a front view of part of another machine;
2 Figure 12 is a front view of part of another machine including a
3 pre-trimming disc;
4 Figure 13 is a view from underneath the pre-trimming disc in
5 Figure 12;
6 Figure 14 is a front view of a modified form of the machine shown
7 in Figure 12; and
8 Figure 15 is a plan view of part of another different machine.

9 The machine shown in Figure 1 is of a generally conventional
10 layout, comprising a shower channel 10 up which tobacco is showered
11 pneumatically into an inverted trough formed by a suction band 12 and
12 fixed side rails (not shown). The filler stream thus formed on the band 12
13 is trimmed by a trimming device 14 and is then carried by the band 12
14 into a garniture 16 in which the filler stream is enclosed in a continuous
15 wrapper web 18. The web 18 is carried through the garniture by a
16 garniture tape 20.

17 Figure 1 shows the suction band 12 passing around two pulleys
18 22 and 24. Figure 2 is an enlargement in the region of the pulley 24.

19 As shown in Figure 2, the band 12 comprises a relatively thick
20 main band 26 (e.g. 1mm thick) formed with apertures 28 for dense
21 ending purposes, and a thin woven band 30 which lies between the
22 main band and the cigarette filler stream 32. Suction is applied through
23 the bands from a suction chamber 34 and draws portions 30A of the thin
24 band 30 into the apertures 28 so that additional dense ending portions of
25 tobacco are formed in the regions of the apertures, the outer surface of
26 the filler stream 32 being trimmed at a set level by the trimming device
27 14.

28 The main band 26 is driven by projections 24A on the pulley 24.
29 These projections engage in the apertures 28 and also serve to displace
30 the portions 30A of the flexible band out of the apertures 28 as the filler
31 stream is being transferred from the bands and onto the wrapper web 18
32 (Figure 1). One of the projections 24A at the bottom of the pulley 24 is
33 shown performing this function.

34 Figure 3 shows dual bands in a generally similar machine. In this
35 example, however, the main band 40 is in the form of a timing belt
36 having inner teeth by which it is driven by corresponding teeth on a
37 pulley 42. The outer surface of the band 40 in this example is formed
38 with recesses 40A (e.g. 0.5mm deep) and is covered by a flexible band

WO 96/27304

PCT/GB96/00533

5

1 44. As in the previous example, the flexible band is able to be drawn by
2 suction into the recesses 40A to form dense ending portions. However,
3 this example differs in that the flexible band 44 extends beyond the
4 pulley 42 and returns around separate pulleys 46, 48 and 50. Thus the
5 band 44 is able to carry the filler stream, with the aid of suction, into the
6 garniture (not shown). For this purpose, the band 44 is preferably
7 somewhat narrower than the band 40 and may in fact be narrower than
8 the recesses 40A in the band 40 (which may themselves terminate short
9 of the side edges of the band 40), so that the entire width of the band 44
10 is able to be drawn into the recesses. To facilitate this, the band 44 is
11 under low tension and may be driven almost entirely as a result of the
12 portions of the band 44 engaging in the recesses 40A in the main band.

13 In the region where the band 44 extends beyond the band 40
14 (towards the pulley 46), it may serve as a moving shoe which, with the
15 aid of an upper guide member (not shown), progressively compresses
16 the cigarette filler stream against the wrapper web (not shown); it may
17 also become progressively convex in cross-section so as to shape the
18 filler stream towards the desired final circular cross-section.

19 Figure 4 is a plan view of part of a machine in which the side walls
20 of a trough 50 into which tobacco is showered upwards to form a filler
21 stream are formed by opposed bands 52 and 54. As shown in the
22 drawing, each of these bands has opposed recesses 52A, 54A for dense
23 ending. Each of the bands may be in the form of a timing belt and may
24 be perforated, in the manner already described, for the transmission of
25 suction.

26 Above the bands 52 and 54 there is a suction band (not shown)
27 which forms the "bottom" of the trough and serves to carry the cigarette
28 filler stream beyond the recessed bands 52, 54 after trimming has
29 occurred. Figure 4 shows fixed side rails 56 and 58 which confine the
30 sides of filler stream after it has moved beyond the bands 52, 54. It
31 should be understood that the spacing between the rails 56, 58 is
32 preferably greater than the width of the filler stream in the region of the
33 dense end portions.

34 As an aid to ensuring that the dense end portions of the filler
35 stream extending into the recesses 52A, 54A leave the recesses as the
36 filler stream moves beyond the bands 52, 54, the following provision may
37 be made: air at above atmospheric pressure may be applied to the inner
38 surfaces of the bands 52 and 54, as the bands approach the rails 56, 58.

WO 96/27304

PCT/GB96/00533

6

1 to cause air streams to flow through perforations in the recessed areas of
2 the bands so as to displace the tobacco from the recesses.

3 Figure 5 shows a machine which has some points of similarity with
4 Figure 4. Tobacco is showered pneumatically up a channel 60 into a
5 trough formed by opposed side bands 62 (similar to bands 52,54 in
6 Figure 4) and a top suction band 64. However, in this example the filler
7 stream is carried by the side bands 62, beyond a return pulley 66 for the
8 top band 64, to a position at which a further suction band 68, passing
9 between the side bands 62 in the region of their return pulleys 70,
10 carries the filler stream generally downwards into the garniture area 72 in
11 which the filler stream is enclosed in a wrapper web 74. The filler stream
12 is trimmed by a trimming device 76 while being conveyed by the
13 opposed side bands 62; as shown in Figure 5, trimming occurs beyond
14 the stage at which the upper surface of the filler stream is confined by
15 the band 64, the upper surface being instead confined by a fixed guide
16 (not shown). Alternatively, for example, the filler stream may be trimmed
17 while it is being carried by the band 68.

18 Figure 6 illustrates diagrammatically a machine in which tobacco
19 is showered through a channel 80 lying in a horizontal plane and
20 towards a band 82 inclined to the direction of movement of the
21 showered tobacco. This arrangement may be applied to a single-band
22 construction or to a construction in which two tobacco sub-streams are
23 formed on converging bands as generally described in our U.S. patent
24 No. 5199466. Another possibility is that two cigarette filler streams may
25 be formed on two converging bands and may be used to form separate
26 cigarette rods, for example, as described in our British patent application
27 No. 9425979.3.

28 As shown in Figure 6, the band 82 has dense ending recesses
29 82A and extends around a guide member 84 (or around a large-diameter
30 pulley) before returning around a pulley 86. The filler stream 87 is
31 carried beyond the pulley 86 by a suction band 88 arranged to carry the
32 filler stream on its underneath surface and to deposit the filler stream on
33 a wrapper web (not shown) in a conventional garniture.

34 While being carried by the suction band 88, the sides of the filler
35 stream are confined by fixed rails 90,92 (Figure 7) which, it will be
36 understood, may be spaced apart by a distance greater than the
37 thickness of the filler stream (measured normally to the band 82) in the
38 region of the dense ending recesses 82A. Figure 7 shows the filler

WO 96/27304

PCT/GB96/00533

7

1 str am 87 as it is initially formed on the band 82, and also in the altered
2 form 87A to which is transformed on transferring to the band 88.

3 The filler stream in Figure 6 may be trimmed before it is received
4 by the suction band 88. The trimmer for this purpose, and in the other
5 examples, may be of a relatively simple construction since it is not
6 required to produce dense ends by its own operation. For example, the
7 trimming device may comprise a simple shear cutting device or a lawn
8 mower type of construction. Alternatively, in any of the examples,
9 trimming may be omitted and tobacco redistribution producing a
10 substantially flat outer surface may be achieved in the manner described
11 in our British patent application 9422581.0.

12 Figure 8 shows a modification of the Figure 6 machine, similar
13 parts having the same reference numerals. The second band 88 has
14 been omitted from this figure to show a curved wall 89 which is spaced
15 from the filler stream as it passes around the curved guide 84. The wall
16 89 has numerous inclined air inlets 89A to admit air streams in directions
17 having components in the direction of movement of the filler stream.
18 These air streams help to retain the bulk of the filler stream on the band
19 82, against the centrifugal force tending to have the opposite effect,
20 while allowing tobacco peaks to be spread or redistributed so that the
21 outer surface of the filler stream ends up at a more uniform height from
22 the band 82. This redistribution effect may render it unnecessary to trim
23 the filler stream. In this connection reference is again directed to the
24 above-mentioned patent application 9422581.0.

25 Figure 9 is a section on the line IX-IX in Figure 8, but shows a
26 modified form of band 82¹ which is of uniform thickness but has
27 recesses formed by deforming a central portion of the band, as shown in
28 Figure 9. The band 82¹ may be made of metal or of a semi-rigid plastic.
29 As shown in Figure 9, the guide 84 is in two parts supporting the
30 respective edges of the band 82¹. Air bearings may be formed between
31 the guide 84 and the band edges by supplying high-pressure air to
32 passages in the guide 84 (not shown) leading to the surfaces adjacent to
33 the band edge portions.

34 Figure 10 is a cross-section showing an alternative arrangement
35 for transferring the filler stream 87 from the band 82¹ to a top band
36 identified in this case as 94. The rails 90 and 92 in Figure 7 have been
37 omitted and the band 94 receives the filler stream directly from the band
38 82¹. For this purpose, while the band 82¹ moves horizontally, the band

WO 96/27304

PCT/GB96/00533

8

94 moves along a slightly downwardly inclined path so that it gradually removes the filler stream from the band 82¹. Air may be simultaneously blown out through the apertures in the dense ending recesses in the band 82¹ to ensure that the tobacco in the recesses transfers along with the remainder. The right-hand edge of the band 94 (as seen in Figure 10) is supported by a guide rail 96. Figure 10 shows the band 94 near the start of the tobacco transfer operation.

During the transfer operation (or afterwards) the bottom of the filler stream may be trimmed. In order to control the cigarette weight, the height of the trimming device may be controlled (as is commonly done) or alternatively the vertical position of the band 94 may be controlled in the region above the trimming device.

Figure 11 shows a portion of a recessed belt 96 according to the first aspect of this invention carrying a filler stream 97, and means for pressing dense ending portions of the filler stream into recesses 96A in the belt. These means comprise a belt 98 (possibly a timing belt) formed with projections 98A at the same intervals as the recesses 96A in the band 96. The belt 98 passes around pulleys 100 and 102 and is supported by a guide 104 so arranged that the operative part of the belt 98 converges towards the belt 96 at a small angle. Thus the projections 98A progressively press and compact the dense end portions of the filler stream. While still in substantially this condition, the filler stream is subsequently trimmed along its outer surface by a trimming device (not shown) which is at a set position subject to adjustment to control the average weight of the cigarettes.

Instead of the belt 98, a wheel with projections may be used to compact the dense end portions of the filler stream before trimming.

The belt arrangement shown in Figure 11 may also be used to compact the end portions of a filler stream, before trimming, in the case of a machine with a suction band which is not recessed in the manner shown in Figure 11. Such examples are described below with reference to Figures 12 to 14.

In each of the above examples, the speed of the band delivering the filler stream into the garniture may be made slightly adjustable to enable the distance between the dense ending portions of the filler stream in the final cigarette rod to be adjusted.

Figure 12 shows part of a different machine in which a suction band 105 is used to carry a cigarette filler stream 106 towards a position

WO 96/27304

PCT/GB96/00533

1 at which the trimmed filler stream is deposited on a continuous wrapper
2 web (not shown). In this arrangement, the filler stream 106 is
3 pre-trimmed by a disc 108 mounted parallel to the band 104 and at a
4 distance less than the height of the filler stream 106 before trimming.
5 The disc 108 projects into the filler stream and rotates in a direction such
6 that its periphery moves in approximately the same direction as the filler
7 stream. Excess tobacco lying below the level of the disc 108 tends to be
8 removed from the filler stream with the result that the filler stream has a
9 more uniform height than existed before pre-trimming.

10 Figure 13 shows the excess tobacco 110 being swept laterally
11 away from the filler stream. However, this tobacco is redirected in this
12 example onto a further band 112 which lies immediately below the band
13 104 and converges towards the band 104 while moving between pulleys
14 114 and 116. The band 112, in passing between the pulley 116 and a
15 further pulley 118, then moves in a direction parallel to the band 104. A
16 suction chamber 120 below the upper run of the band 112 applies
17 suction through spaced perforated areas of the band 112 on which
18 tobacco removed by the disc 108 collects to form dense-ending mounds
19 122. These mounds of tobacco are pressed into the filler stream as the
20 band 112 passes around pulley 116 and then proceeds in a direction
21 parallel to the band 104. Subsequently the filler stream is trimmed at a
22 set level by a conventional main trimmer (not shown), the end portions of
23 the filler stream resulting from this trimming being at a greater density
24 because of the addition of the mounds of tobacco 122.

25 Figure 14 is an enlarged view of a modification of Figure 12. This
26 shows each perforated area 124 of the band 112 being formed in a
27 domed manner so as to project upwards from the general surface of the
28 band 112. Each of these domed areas therefore not only applies a
29 mound of tobacco to the filler stream, but also presses the mound into
30 the filler stream in basically the same manner as described with
31 reference to Figure 11.

32 Each of the domed areas 124 may be formed by outwardly
33 deforming a central area of the band 112, which may be of metal, leaving
34 the edge portions of the band lying in the same plane as the remainder
35 of the band. As an alternative, dense ending may be produced by
36 projections on a band such as the band 98 (Figure 11) or band 112
37 (Figure 14) progressively compacting the filler stream without the
38 opposed recesses 96A (Figure 11) and without adding tobacco as in

WO 96/27304

PCT/GB96/00533

10

1 Figure 14.

2 Alternatively, the tobacco used to form the mounds on the band
3 112 in Figure 12 or Figure 14 may comprise part or all of the tobacco
4 removed from the filler stream by the main trimmer.

5 Figure 15 shows a different example which is based upon a
6 machine described in our British patent application No. 9512938.3. In
7 this example, tobacco forming the filler stream is showered through a
8 chimney 126 which starts vertically and then curves towards the
9 horizontal to shower tobacco onto the inside surface of a band 128
10 which passes around pulleys 130, 132 and 134 having vertical axes of
11 rotation. The filler stream, identified as 136, thus passes around the
12 pulley 132 while being constrained against centrifugal action by the band
13 128. Then as the filler stream moves beyond the pulley 132 and towards
14 the pulley 134, it is transferred to an overhead suction band (not shown)
15 which carries the filler stream past a trimming device and into the
16 garniture of the machine.

17 The pulley 132 has a circumferential recess for accommodating
18 the filler stream. The bottom wall of that recess is perforated at spaced
19 intervals, and suction is applied through the perforations from the inside
20 of the pulley 132 so as to form mounds of tobacco 138; that is to say
21 from tobacco showered through the chimney 126 in the left-hand region
22 so as to arrive on the pulley 132. These mounds of tobacco 138 are
23 then pressed into the filler stream 136 as the filler stream passes around
24 the pulley 132.

25
26
27
28
29
30
31
32
33
34
35
36
37
38

WO 96/27304

PCT/GB96/00533

11

Claims:

1. A cigarette making machine including a conveyor (96;105) which is arranged to carry a cigarette filler stream (97;106), with the aid of suction, past a trimming device (14) which removes excess tobacco at a set distance from the conveyor, and a second conveyor (98;112) which moves in a substantially linear direction converging towards the first conveyor and progressively presses the filler stream at cigarette end regions which are required to have a greater density.

2. A machine according to claim 1, in which the second conveyor (98;112) has projections (98A;124) which press the filler stream at the required positions.

3. A machine according to claim 1 or claim 2, in which the second conveyor (112) is arranged to receive mounds (112) of tobacco which it presses into the filler stream at the dense end regions.

4. A machine according to claim 3, including a pre-trimmer (108) which pre-trims the filler stream at a substantially set level, and in which at least a proportion of the tobacco removed by the pre-trimmer or by the main trimmer is fed to form the mounds (122) on the second conveyor (112) which are subsequently pressed into the filler stream.

5. A cigarette making machine in which a cigarette filler stream is formed by showering tobacco into a trough defined by at least one band (26,30; 40,44; 52,54; 82,82¹; 96) which is formed with recesses or apertures (28; 40A; 52A,54A; 82A) at regular positions at which the cross-sectional area of the filler stream, after trimming at a set level, will be greater than elsewhere owing to the fact that the filler stream formed from the showered tobacco extends into the recesses or apertures in the band.

6. A machine according to claim 5, in which there is a band (26; 40) which has apertures or recesses, and an additional band (30; 44) which lies between the first band and the tobacco and is flexible so as to be able to deflect into the apertures or recesses.

WO 96/27304

PCT/GB96/00533

12

1 7. A machine according to claim 6, in which the
2 first-mentioned band (26) has apertures (28) and is driven by a pulley
3 having radial projections (24A) which enter the apertures in the band and
4 displace the second band (30) from the apertures prior to the filler
5 stream being transferred from the bands and being enclosed in a
6 wrapper web.

7
8 8. A machine according to claim 5, in which the band or
9 bands (52,54) formed with recesses form one or both side walls for the
10 cigarette filler stream.

11
12 9. A machine according to claim 8, in which the filler stream is
13 formed between two side bands (52,54) at least one of which is formed
14 with recesses (52A,54A), and is then received by another band (68)
15 passing between the two side bands.

16
17 10. A machine according to claim 5, in which the band (82)
18 formed with recesses is vertical in cross-section and receives
19 horizontally showered tobacco, and in which the filler stream (87) formed
20 on it is then transferred to another band (88) arranged to carry the
21 transferred filler stream (87A) on its bottom surface.

22
23 11. A cigarette making machine arranged to form a filler stream
24 (106; 136) on a first conveyor (105; 128), and including means for
25 forming regularly spaced mounds of tobacco (122; 138) on a second
26 conveyor (112; 132) which presses the mounds of tobacco into the filler
27 stream.

28
29 12. A machine according to claim 11, in which the mounds of
30 tobacco (122) are formed from tobacco removed from the filler stream
31 (106) by trimming.

WO 96/27304

PCT/GB96/00533

1/4

Fig.1.

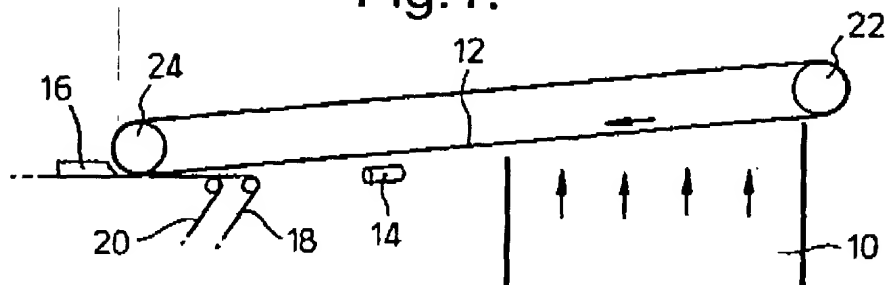


Fig.2.

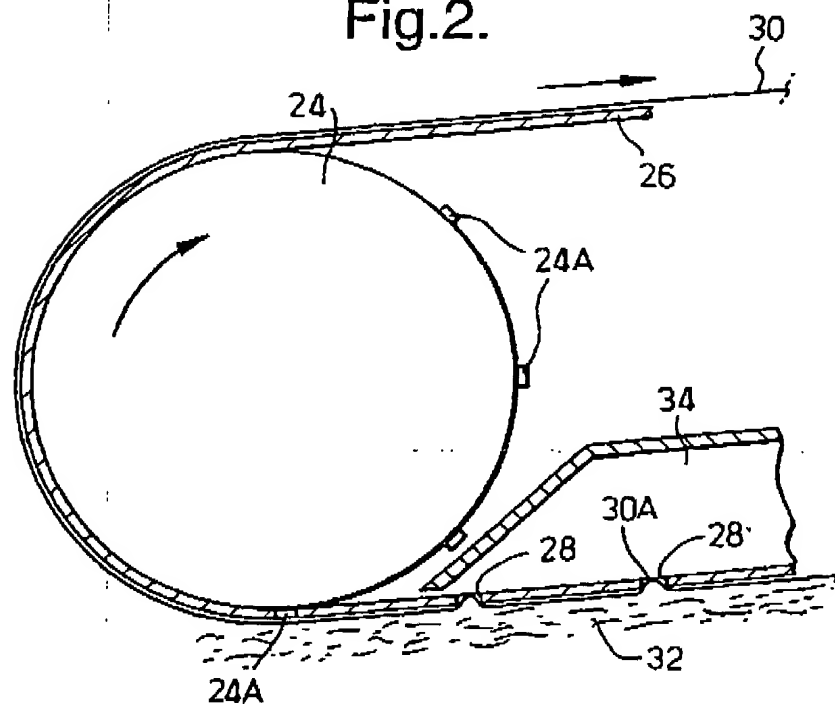
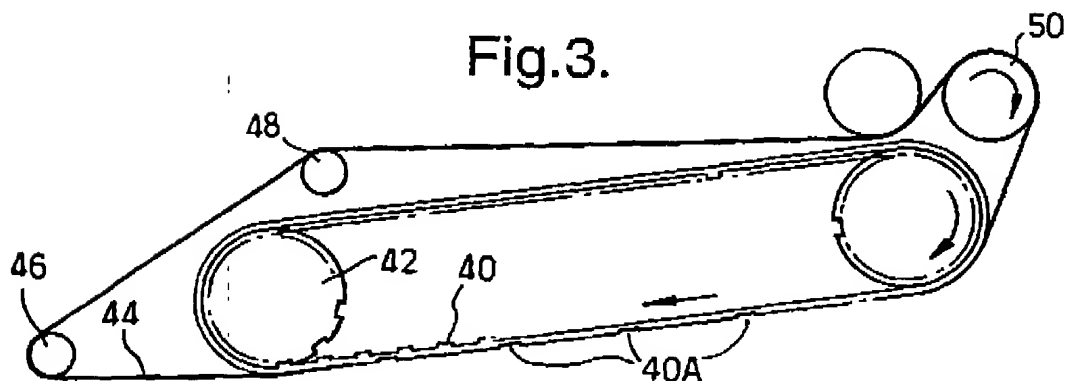


Fig.3.



WO 96/27304

PCT/GB96/00533

2/4

Fig.4.

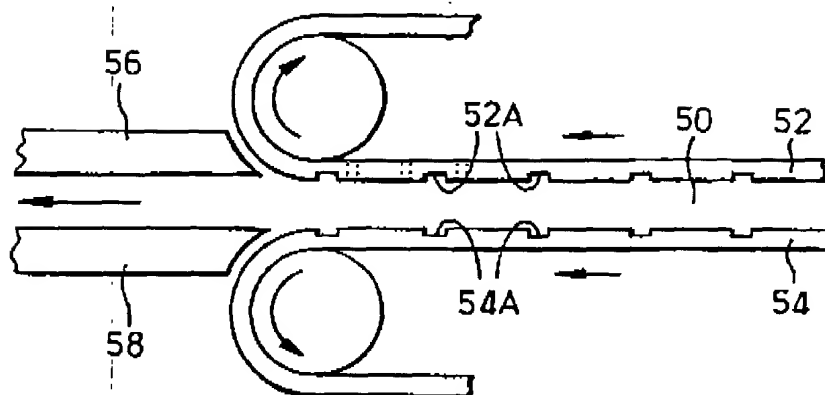


Fig.5.

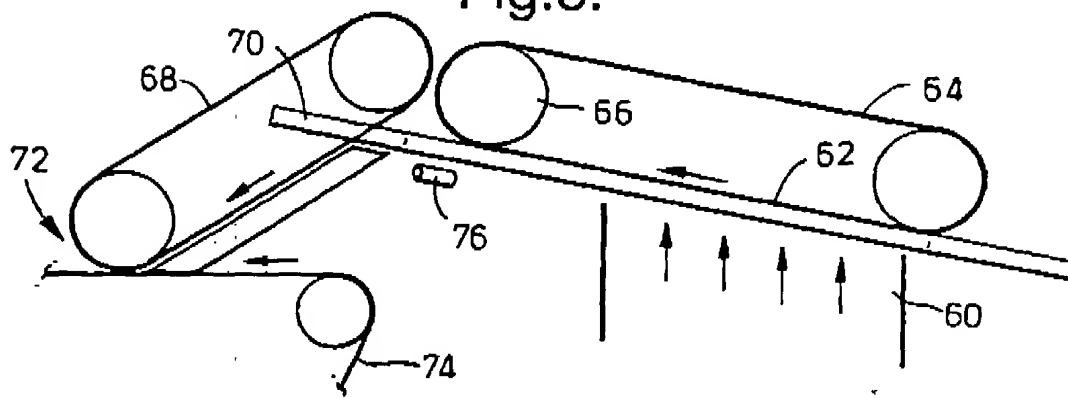


Fig.6.

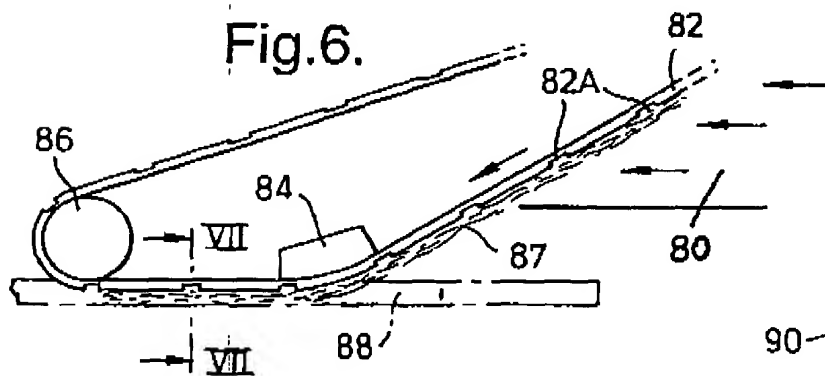
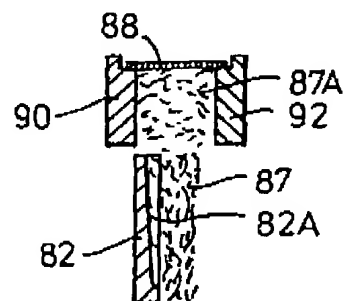


Fig.7.



WO 96/27304

PCT/GB96/00533

3/4

Fig.8.

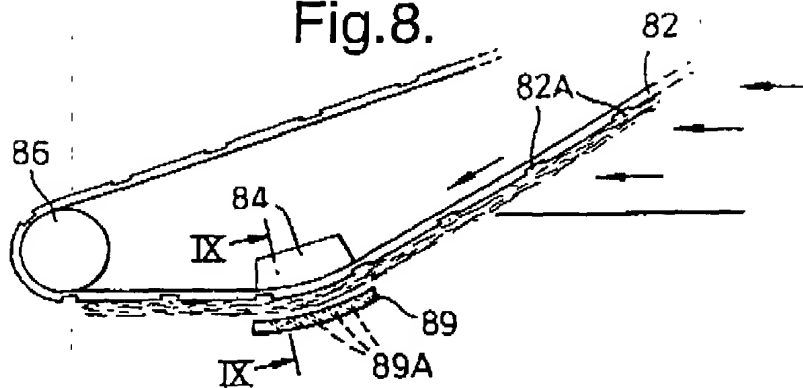


Fig.9.

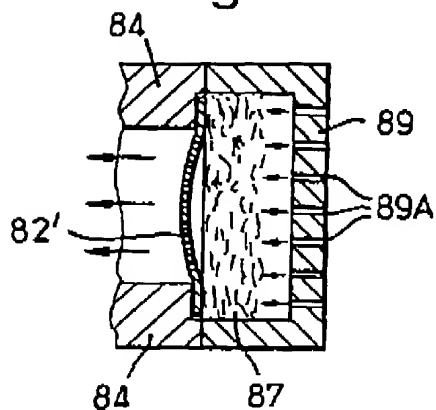


Fig.10.

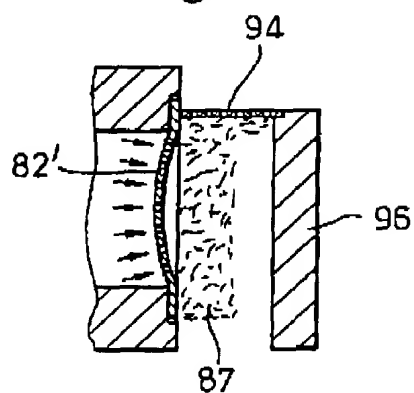
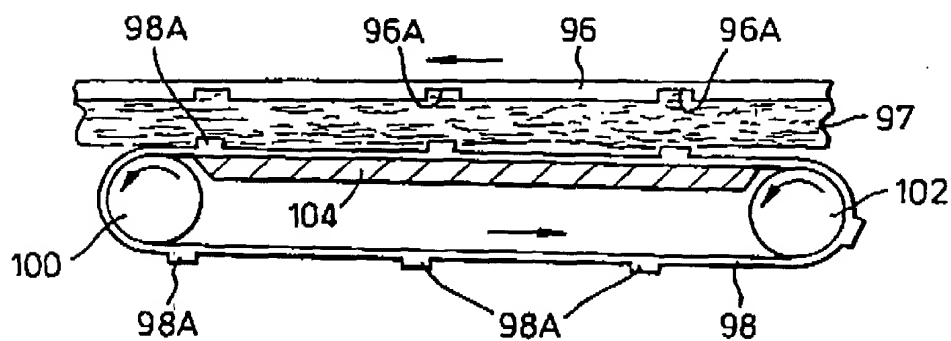


Fig.11.



WO 96/27304

PCT/GB96/00533

4/4

Fig.12.

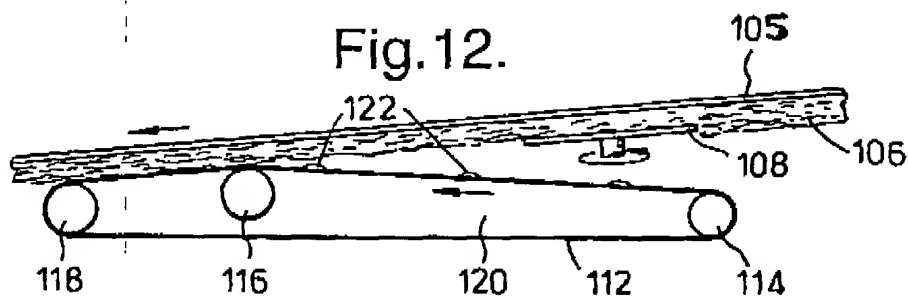


Fig.13.

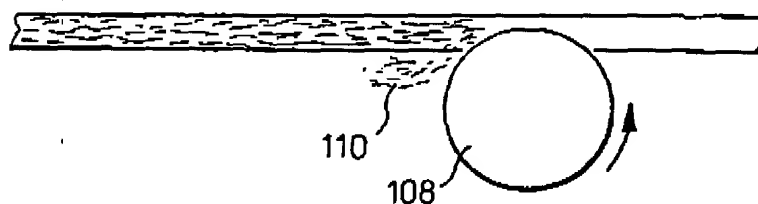


Fig.14.

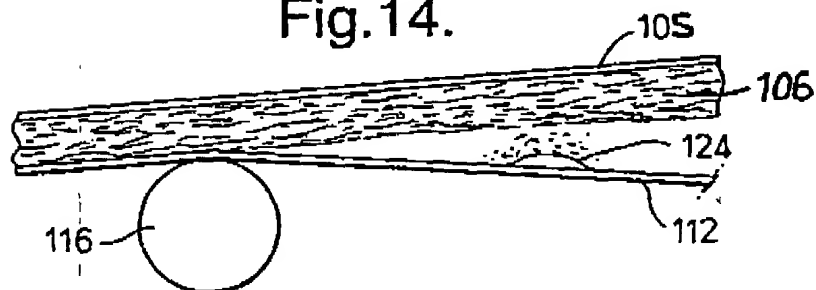
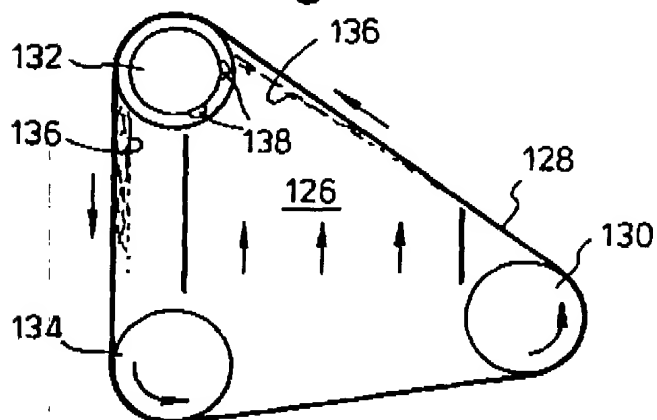


Fig.15.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 96/00533

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A24C5/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,B,11 69 353 (HAUNI-WERKE KÖRBER) 30 April 1964	11
A	see the whole document	1,3
A	US,A,3 795 249 (CRISTIANI) 5 March 1974	1,3,4, 11,12
	see the whole document	
A	DE,A,39 19 999 (KÖRBER AG) 3 January 1991	1,3,4, 11,12
	see the whole document	
A	US,A,3 473 537 (WILDE) 21 October 1969	1,5
	see the whole document	
A	GB,A,948 736 (KÖRBER) 5 February 1964	1-4,11, 12
	see the whole document	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 June 1996

Date of mailing of the international search report

05.07.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Riegel, R

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB 96/00533

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-B-1169353		NONE	
US-A-3795249	05-03-74	CA-A- 923398 DE-A- 2101865 FR-A- 2074069 GB-A- 1284788 NL-A- 7017951	27-03-73 19-08-71 01-10-71 09-08-72 09-08-71
DE-A-3919999	03-01-91	NONE	
US-A-3473537	21-10-69	FR-A- 1509927 GB-A- 1119294	03-04-68
GB-A-948736		DE-U- 1871549	

Form PCT/ISA/210 (patent family annex) (July 1992)